

**UNIVERSITY OF BAHRAIN**  
**COLLEGE OF INFORMATION TECHNOLOGY**  
**DEPARTMENT OF COMPUTER SCIENCE**

**ITCS 385 – Database Systems**

**Midterm Exam**  
**Semester I, 2015-2016**

Date: 28/10/2015

Time: 11:00 - 12:30

<b>Name</b>	
<b>Student I.D.</b>	
<b>Section</b>	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <b>[1]</b>  <b>[2]</b> </div> <div> <i>Please tick one</i> </div> </div>

✖	Question 1	7	6	70.5
	Question 2	7	7	
+1	Question 3	16	12.5	+1
	Question 4	12	10	
	Question 5	8	3.5	
	<b>TOTAL</b>	<b>50</b>	<del>39</del>	<b>40.5</b>

**Notes:**

1. Your answers must be written on the question paper and in the place allocated. Any answer written on any other place will not be marked.
2. Use the back of the pages for any rough work, BUT remember rough work will not be marked.
3. Do not give more than one answer (alternative solutions) to the same question; if you do so then only the first answer will be marked.
4. **Switch off your mobile** and keep it in your pocket or bag.

Question 1 [ 3 + 2 + 2 = 7 marks ]

1. Explain the meaning of the following terms:

Casual end user: This is the user that access occasionally the database, and each time he/she access the database he/she retrieve different informations.

User View Is a specific data view for community of users.

2. In the past few years, advances in technology have led to new applications of database systems, as in 'Multimedia Database'. Briefly explain this type of database systems, and give an example.

Multimedia database simply is the kind of database that stores images, Audio Notes, and ~~vide~~ video clips.

Example of this type of database let's say ~~Twitter~~ "Instagram" application that stores the users photos in there database.

3. 'Self-Describing Nature of a Database system' is one of the main characteristics of the database approach. Briefly, explain this characteristic.

Self-Describing Nature is that the database stores ~~data~~ the description of these data and "data structure" in one place that is in "Data". The place may called "Data catalog" or ~~Dictionary~~ "Dictionary" → these data are formally called the "Metadata".

**Question 2 [ 3 + 4 = 7 marks ]**

1. Briefly explain the difference between the database schema and database state (Show an example to support your answer)?

① Database Schema: It is the structure of the database and not changed frequently ~~at all~~.

ex:

ID	GPA	Major
----	-----	-------

Example  
of  
Student  
GPA  
details.

② Database state: Is the database status or view at particular moment of time.

ex:

ID	GPA	Major
123	4.00	CS
456	3.43	CE

2. Using the same database example for the question above, which DBMS architecture would you choose (Centralized, Two-Tier client-server, or Three-Tier client-server)? Why? And briefly explain the chosen architecture.

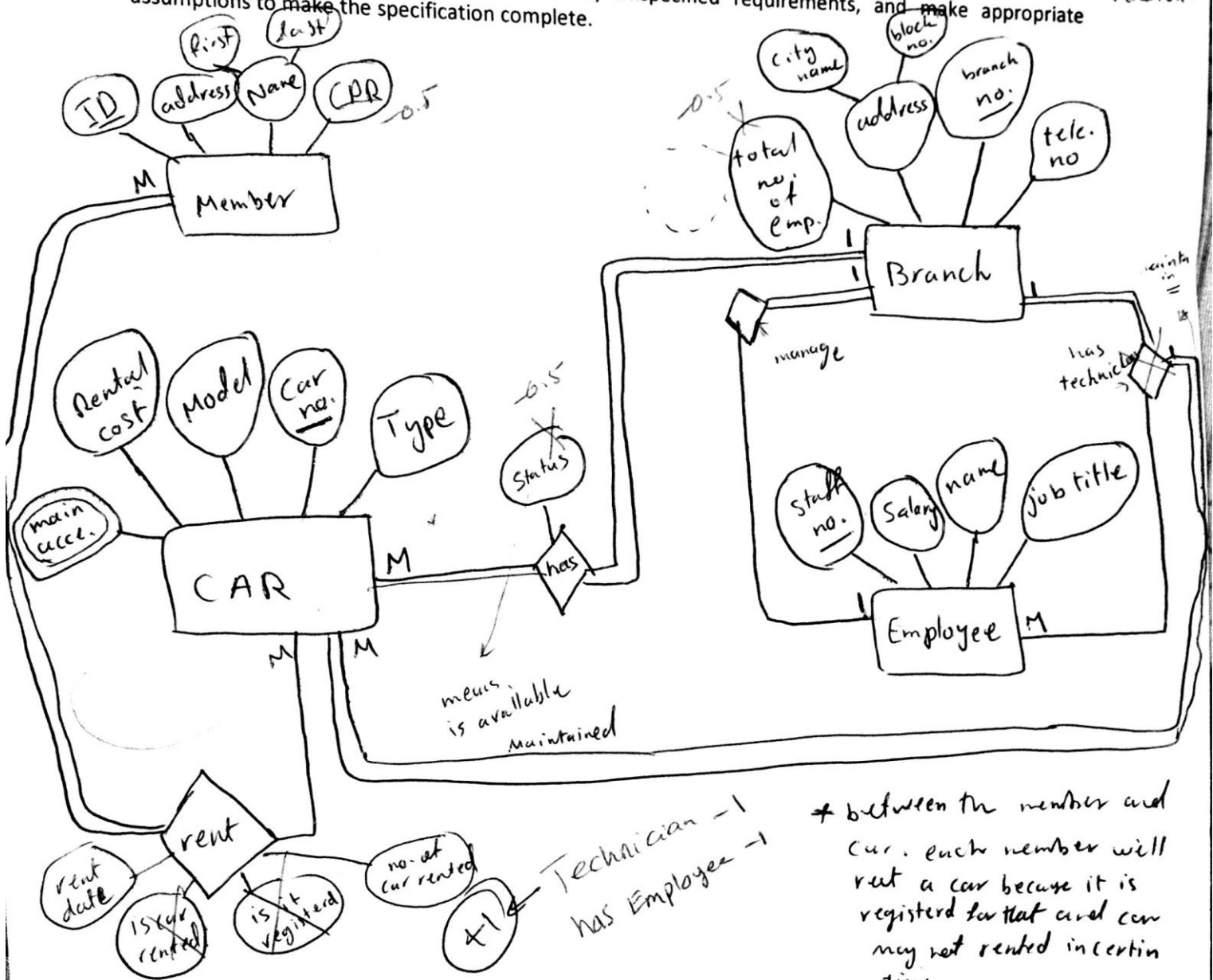
- Three-Tier client-server, because the student ~~most~~ GPA details is private from accessing by other people (i.e. just the specific employees and student how belong to that Mark can see or "Access" this details). The employees here means "Registration Employees" for example.

- Three-Tier client simply is ~~an architecture~~ one of database architecture that specialize in security thing and imediate the server and user interface level.

**Question 3 [16 marks]**

Consider the following requirements for designing a database for a car rental company. The rental company has several branches in the country. The data held of each branch are: a unique branch number, telephone number, branch address, and total number of employees. The branch address is made up of block number and city name. Each branch has a number of employees, including one manager and at least three technicians. The manager is responsible for managing only one particular branch, whereas each technician is responsible for maintaining a number of cars. The data held on each employee is name, job title, salary, and a unique staff number. Each branch has a number of cars. The data held on a car: car number, model, rental cost, type (sedan, sport, van, ...), and the names of the main accessories. The car number uniquely identifies each car. In addition, each car at a branch has a status which indicates whether this car is available or not. Only registered members can rent cars from the company. The data held on a member are: name (first and last), address, CPR, and a unique member ID. Once registered, a member is free to rent up to three cars at the same time. The same car can be rented to different customers at different dates. It is important to record the rental date for each car rental agreement.

Design an ERD for this application. Note any unspecified requirements, and make appropriate assumptions to make the specification complete.



**Question 4 [ 8 + 4 = 12 marks]**

Consider the following Relational Database state to answer Question.4 and Question.5.

Consider the following database schema for online orders. An order is given by a customer on a specific date, which contains one or more items.

**Order** (OID: integer, ItemID: integer, Qty: integer, CID: integer, oDate: Date)

**Item** (ItemID: integer, Description: string, Price: float, category: string)

**Customer** (CID: integer, cName: string, country: string, email: string (unique),

Gender: one character (F or M), income: float (default 100) )

A. Based on the database above, answer the following questions [YES/ NO], and explain why with respect to Relational Integrity Constraints.

1. Is it possible for two different customers to have the same email?

[ YES / NO ] - Why?

Because the email is set to be unique value.

2. Is it possible for an order to have unregistered customer (i.e. CID=NULL) in the order relation?

YES / NO - Why?

Because ~~it can~~ this attribute is an FK of an P.K of another relation and it can be "NULL".

3. Is it possible for the same (itemID and OID) to be repeated in the order relation?

[ YES / NO ] - Why?

Because the OID cannot be repeated. "Must have unique value"

B. Identify alternate key(s) if any for each relation above

Order:

~~{OID, ItemID, CID}~~ X

Item:

{ ItemID, Description } X

Customer:

E-mail ✓



**Question 5 [ 2 + 3 + 3 = 8 marks]**

Write the following queries in SQL statements using the database state shown in Question 5.

1. What would be the new price of each item if it is increased 10%. Show the ItemID and new price of each item.

```
SELECT ItemID, price * 10% ;
FROM ?
```

(-1)

2. Retrieve the names of all female customers who live in Bahrain or in Kuwait and have income more than 500.

```
SELECT CName
WHERE Gender = %F% & ( country = %Bahrain% ||
country = %Kuwait%) AND
income = 500;
```

(-2)

3. Create the customer relation.

```
CREATE TABLE customer {
  CID int
  CName varchar string
  Country string
  Email string
  Gender varchar(1)
  Income float(100)
};
```

primary key

unique

(-1.5)